**The Report Committee for Adrianne Marie Stropes**
**Certifies that this is the approved version of the following report**

# The Leaky Pipeline of Women in STEM
# Motherhood as a Watershed for Technical Women

**APPROVED BY**
**SUPERVISING COMMITTEE:**

**Supervisor:**

Anthony P. Ambler (Supervisor)

Emily Amanatullah

# The Leaky Pipeline of Women in STEM
# Motherhood as a watershed for technical women

**by**

**Adrianne Marie Stropes, B.A.**

**Report**

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

**Master of Science in Engineering**

**The University of Texas at Austin**

**December 2009**

# Abstract

## The Leaky Pipeline of Women in STEM
## Motherhood as a watershed for technical women

Adrianne Marie Stropes, MSE

The University of Texas at Austin, 2009

Supervisor: Anthony P. Ambler

This research focuses on the experiences of technical (i.e. computer science, I/T and engineering) women. It starts with childhood and goes through professional, with the professional focus on motherhood as a potential conflict for women in technical fields. Results from an on-line study of India and U.S. are used for a comparative analysis. Many factors including demographic, burnout, enjoyment and family conflict are evaluated. Finally, the survey ended with a freeform section, which allowed respondents to share their thoughts on motherhood. Responses were varied but added great insight to the diverse views women hold. However, common themes still evolved, such as the role of the manager, spouse and the concept of motherhood.

# Table of Contents

Chapter 1: Introduction ..... 1

Chapter 2: Barriers in Education (K-16) ..... 5

K-12.. ..... 5

Undergraduate Studies ..... 8

Recommendations: K-16 ..... 13

Chapter 3: Barriers in Career ..... 18

Relevant U.S. Labor Laws ..... 18

Role of Management, Legal ..... 20

Career History ..... 21

Women as Deviants to the (Male) Norm ..... 24

Chapter 4: Independent Empirical Research ..... 27

Methodology ..... 27

Quality of Life: Enjoyment, Burnout, and Depletion ..... 28

Gender and Work Identities: Separation and Conflict ..... 30

All in the Family: Career Choices of Family Members ..... 31

Respondents' Career and Family Involvement ..... 32

Maternity Leave ..... 33

Breastfeeding ..... 34

Perception of Mothers' choices ..... 35

Comparative Analysis: India ..... 36

Freeform Motherhood Responses ..... 39

Chapter 5: Future Directions ..... 43

Chapter 6: Recommendations for Professionals ..... 45

Recommendations: Employees ..... 45

Recommendations: Employer ..... 46

Recommendations: Management ..... 46

Tables ..... 48
Table 1: ..... 48
Table 2: ..... 49
Table 3: ..... 50
Figures ..... 51
Figure 1: ..... 51
Appendices ..... 52
Appendix A: ..... 52
References ..... 61
Vita… ..... 66

# Chapter 1: Introduction

So much for the dot-com bust. In 2002, there was a shortage of 835,000 IT professionals. ("Bouncing…" 2002) Despite this, surprisingly women's enrollment in science, technology, engineering and math (STEM) majors is still disproportionate to men's.

Only 26 percent of US Information Technology (IT) workers are women. ("New Alliance…" 2007) In no European Union states do women constitute more than 30 percent of IT jobs and the figure is usually closer to 20 percent, with the UK showing the greatest downward trend. (Wilson 2003) With such an overall need for skilled IT workers, increasing women's participation may help overcome the shortage.

Out of all the STEM majors, computer science is perhaps the most concerning. According to the US Department of Labor, there will be an additional "1 million computer-related jobs…created by the year 2014." ("New Alliance…" 2007) Despite these prospects, female computer science (CS) majors peaked in 1986 at 15,126. In 1995, there were 7,063 (Varma & Lafever 2007), and between 1996 and 2004, the number of female freshman who majored in CS went down 80 percent. (www.ncwit.org) "While the percentage of men intending to major in CS is no worse than the mid-1990s, the number of female CS majors is at a historic low. This drop is occurring while their academic numbers are increasing, as the majority of college students today are female." (Patterson 25 2005)

One might argue that times have changed and women feel more freedom to choose their majors and careers than ever before. Why, then, should we be concerned if

women show less interest in CS and other STEM fields? For one thing, technology itself may suffer. When computing technologies are created by a more diverse set of people, they will end up being more relevant and useful to a broader population of people. (Roberts 2003) "[W]omen's underrepresentation in CS departments is likely to thwart the progress of CS as a discipline limiting potential contributors to the scientific field." (Pearl 1990) Since computer technology has become "an integral part of national economies [the lack of women may have] negative social, economic and scientific consequences". (Papastergiou 2008)

Businesses should also care, because diversity isn't "just nice"—it affects the bottom line. Roy Adler (a Fulbright scholar) studied Fortune 500 companies for almost two decades and found:

> a strong correlation between women in the executive suite and high profitability. In fact, within the 25 Fortune 500 companies with the best record of promoting women into high positions, profits were higher [than the median] by…18-69%.

(For skeptics, revenues, assets and stockholders' equity were all evaluated.) (Simosko 2008) Another study, by Catalyst, found that "corporations with the highest proportion of women on their boards delivered equity returns that were 53 percent higher than those with the lowest representation of women." These two groups also showed a 66 percent difference in return on invested capital. (Amble 2007) Without a considerable pool of female engineers, how likely are tech companies to have high ranking female executives?

Economics on a more personal scale also suffer. Women still make less than men, and they are missing out on jobs with some of the highest (post bachelors) salaries. "[T]he compound annual growth rate of IT wages has been about 4% since 1999 while inflation has been just 2% per year." (Patterson 26 2005) "Separate research has found

that women executives working in women-led firms earn between 15 and 20 per cent more in total compensation than women working in other firms and that having a woman at the helm of a company is instrumental to the success of other executive women in quantifiable and significant ways." (Amble 2007) This suggests possible discrimination, but I also believe more entry-level female engineers will eventually lead to more higher ranking female executives.

A literature review shows there are many places women face obstacles in STEM. Many may never *opt in* while others may start in the pipeline but *opt out* during college or even once in the technical workforce. While each phenomenon is worthy of individual study, this paper takes a broader perspective in an effort to see the full life cycle, from childhood through career. Many themes are present amongst the various age groups, but there also are some crucial "watershed" moments, such as motherhood, that will be further emphasized in this paper.

While reviewing previous studies, many questions came to mind. For example, are the problems faced by technical women lessened as time has progressed? Based on changes in the workforce, and even in familial structures, you would expect some issues to be alleviated between, say, a study in the 1980's or 1990's and my study in 2009.

That led to other questions. Is the above assumption largely American or Western? While there were diverse countries studied in a large volume of literature, most countries studied were Western. What about India? India was much more prominent in the technology world since most of these studies were written.

So, after the study of the lifecycle or women in STEM, a survey concept emerged. It would look at career aspects of present-day women in the U.S. and India. The groups

as a whole would be analyzed on measures such as career and family conflict, burnout, and their views on and experiences with motherhood.

Next, culture was isolated as an influence. One hundred and nineteen total women participated in the study, of which 101 were American and 18 were Indian (34 total were born in India). The groups were divided to see on which axes they were most similar and most different.

This analysis will be near the conclusion of the paper, building from the foundational research which inspired the study. But, first, let us start at the beginning, with the focus on K-16 ages and education.

# Chapter 2: Barriers in Education (K-16)

## K-12

A common theme is women exiting the field. Here the "exodus" in education is explored. In "Decoding the Female Exodus from Computing Education", Varma focuses on seven minority institutions. She states that almost a third of female CS majors (1994-2000) switched.

In the article "Seeing Gender", Spears acknowledges that blatant discrimination in the classroom is no longer the issue. However, there are still many subtle barriers.

> Psychologists tell us that at an early age we develop a set of largely unconscious hypotheses about sex differences, called gender schema. These schema lead teachers—male and female alike—to have different expectations of and often interact differently with male and female students. They also lead male and female students to behave differently in classrooms, sometimes drawing teachers into interactions that disadvantage females. (136)

"Short circuiting" is an example of a barrier for girls in the classroom that is unlikely to be intentional discrimination by teachers. When students ask for help, male students are likely to be *talked through* the problem; however, the teacher will *take over* the task for the female students. In an observed computer class, "girls were more likely to take their hands away from the mouse and keyboard in anticipation of a teacher's help, whereas boys kept their hands on the equipment." (Spears 136 2008) If girls were walked through problems at an earlier age, would they still remove their hands from the equipment?

Perhaps there are other factors that affect women's self-efficacy in STEM fields at an early age. For example, if a boy is successful at math and science, he is seen as

"talented"; if he fails, he is seen as "not trying or following the rules of form." On the other hand, successful girl is seen as trying harder rather than being academically talented. (Spears 136 2008)

Is it any wonder, then, that males have more confidence in their abilities in STEM fields? Consequently, boys may (unintentionally) be:

> effectively silencing females in the STEM classrooms or taking over manipulation of the laboratory equipment. In addition, research suggests that girls prefer to observe longer before beginning an experiment, but boys are often quick to get their hands on the equipment, no only setting the pace for the class but also getting more hands-on time in the laboratory. Females also often like to observe phenomena longer before posing hypotheses, yet teachers feel they need to move on when males get restless. (Spears 136 2008)

Further, even the "ratio of computers to pupils in schools, the location of computing in science and math classes and the emphasis on experience gained in computer clubs, all have benefited boys rather than girls." (Newton 1991; Culley 1986; Hoyles 1988)

**Home Usage**

A study that took place in the UK found that boys are *six times* more likely to have a computer bought for them than girls. (Cole *et. al* 1995) Overall, men have more experience with computers before starting undergraduate studies. (Durndell *et. al* 1987; Shashaani 1994, Comber et. al 1997). In Wilson's study of Psychology & CS students, she found that more males than females in both majors owned their own computers. While early access is called out in some studies, Wilson points out that "ownership may encourage use and feelings of involvement with computing." (132) Men are also more likely to have to have opened a computer. (Beyer *et. al* 2004)

Papastergiou found that 40.3 percent had a brother or father who knew how to use a computer but only 26.7 percent had a mother or sister who did. (However, this had no statistical significance.) In Wilson's research, 3 of the students' mothers but only one of their fathers were 'afraid' or 'unsure' around computers. One male said, "'Everyone's equal' but went on to say 'Having said that my mother is afraid. People are afraid of deleting files that are important, doing something wrong when computers are expensive."

"Alan Durndell claims that by the time girls are 15 or 16 they have been turned off career choices involving computers due to 'violent and immature' computer games (*The Guardian,* 21 December 1996: 6). Girls are turned off by boring, violent video games and dull programming classes. "When it comes to computer games and software, girls want high skill not high kill." (AAUW 2000) Since software (including game software) is written mostly by men, the design will be more suited for men (Huff and Cooper 1987)." (Wilson 129 2003) This is likely to exasperate the already negative trend of women's view of the CS profession.

Late exposure to computers also puts students at a disadvantage:

> 'Those who haven't the experience feel disadvantaged. It is more girls that feel this way but some lads as well' (F3). (Wilson 2003)

> My first contact with computers was when I was 15 and consequently I have little knowledge of this subject. In my home there is no computer, and the two hours per week at school are not enough. I don't have the background to cope with studies in CS."
>
> --15 year old girl (Papastergiou 2008)

In a study of "minority institutions" students, many (non-Asians) accessed computers for the very first time in their junior or senior year of high school. Across the board, male

students had more access to home computers than their female counterparts. (Varma 2007)

## UNDERGRADUATE STUDIES

### Exodus

A common theme is women exiting the field. Here the "exodus" in education is explored. In "Decoding the Female Exodus from Computing Education", Varma focuses on seven minority institutions. She states that almost a third of female CS majors (1994-2000) switched to a different major. Through social control theory, she explains, "how secondhand knowledge of comparatively infrequent negative experiences achieves substantial immediacy and veracity among women students en masse." (186) So, the negative experiences of *few* are able to influence the *majority* of women.

Social control theory comes from sociologist John Braithwaite (1989). It states, "shaming may constitute a compelling control mechanism." (185) Varma believes the CS/CE environment is a similar atmosphere to what Braithwaite describes. In this instance,

> gossip – or more precisely, an individual's awareness or reasonable speculation that others are gossiping about him or her – which can have a profound effect on his or her propensity for engaging with others and embracing social norms…it...can make less common experiences appear ubiquitous, providing support for generalized perceptions of how men receive women's presence in CS programs *independent of or even contrary to* individual women's firsthand experiences…Due to the differential socialization of women and men, women are likely to decode certain behaviors or remarks as biased more often than do their male peers. The implication is that secondhand knowledge of some women's comparatively infrequent, negative experiences, and of men's negative impressions of women, somehow attains substantial immediacy and veracity among CS female students en mass. (186)

To investigate the influence of this gossip, also called 'shaming', Varma investigates attrition in CS/CE. The study excluded first-year students, who would be

less likely to answer based on experiences in the major (courses). What was found is that women were more likely to say they seriously considered changing majors (59 percent vs. 44 percent). Overall, 50 percent of students had thought about changing their majors.

> 63 percent of women and 53 per cent of men reported no incidents specifically related to gender, with a much smaller number of women (11 per cent) and men (7 per cent) reporting that they possessed personal knowledge of prejudice against women...56 per cent of women and 60 per cent of men said that male students treat females as peers, while 20 per cent of women and 13 per cent of men remarked that male students are chauvinistic. (188)

It appears, however, that receiving firsthand bias is not necessary to impact minorities. "Women who report *no* firsthand experience with gender bias regularly expressed certain doubts about being a woman in CS/CE that were strikingly similar to those expressed by women who *had* experienced incidents of bias." (192)

Students still seem to cite the difficulty of the curricula in CS/CE as the reason to consider changing majors, not their minority status.

> However, within that group, women were one-third more likely than men to find CS/CE study excessively difficult…Black, Hispanic and American Indian women were much more likely to cite difficulty as a reason to leave CS/CE study than were their White counterparts, with Asian women complaining about the difficulty least often. (186)

Could this be because these groups are more likely to have gone to disadvantaged K-12 schools? Almost of the students thought that their high schools did not prepare them 'at all' for CS/CE education.

**IEEE Findings from Survey of Undergraduate Students**

While many trends have been observed, and there are many theories as to why these phenomenon exist, an article published IEEE says "Just Ask!". While there are some limitations to surveys—the influence of more subtle barriers—the below findings shed some light on others theories and their relative influence. (Weinberger)

Surveyed students came from the female dominated majors (biology, communication, English, psychology and sociology). Also included were the major with the most students (economics/business economics) and women with high SAT-M scores. Information Technology is defined as majors in CS, Computer Engineering (CE) and Electrical Engineering (EE).

Both IT and non-IT major students were asked why they did not choose a certain major. The most common response (.7-.8) was "the courses are not interesting to me" followed by (.5-.7) "because the coursework is too difficult." "[B]ecause the coursework is too time consuming" came in third." "It is important to note that women with very high SAT-math scores are not much less likely to say that these majors would be too time consuming and difficult."

> For each of the three IT majors, at least one-third of the women indicated that they would not choose the major "because I wouldn't expect the classroom atmosphere to be welcoming to me as a woman (if you are a woman) or as a man (if you are a man)...?...The surveyed students did not express this concern about any of the other college majors."

Another reason IT is not welcoming to women, economists theorize, is the fear of becoming outdated during childbearing. Weinberger states there is no direct evidence to support this theory. Only 20 percent indicated this as a reason to avoid CS. While this statistic may be overlooked in other studies, it is notable that *no other majors* were avoided for this reason. Also, about a third noted they would avoid an IT career, because it is "not compatible with taking time off to care for young children." (The affect of motherhood will be further investigated in survey participants currently in the career field.)

Similar trends are shown when women avoid IT careers. The strongest response for CE, computer programmers, and technical support was, "I wouldn't enjoy the work." One increase was about one third believed these careers "would not lead to meaningful or

socially useful work." Does the adding of the word "meaningful" alter the view, or do the students in fact avoid these industries, for the above reason, and not congruently acknowledge that is why they avoid the corresponding majors?

While social barriers in these fields have improved, it is still not an even playing field:

> None of the men reported avoiding IT majors or careers because they expected an unwelcoming classroom or workplace environment. Among all three groups of women, for all three IT majors, the proportions avoiding IT majors for this reason ranged from 24 to 39 percent. (34)

Why have women made strides in law and medicine, which would seem to have similar barriers? (Weinberger 2004) (Spears also notes this contrast with physics.) Apparently women view "the coursework required for careers as surgeons or lawyers is easier to complete than the coursework required to become a computer programmer, CE or EE." (32) Why?

> Any model of education as an investment predicts that, in the absence of barriers to entry, women would simultaneously choose to increase both the time and intensity of study as the anticipated number of years in the labor force grows. About one-third of the women, and none of the men, expressed concern about the classroom climate in IT courses. This suggests the presence of a gender-specific barrier. (34)

**Comparative Analysis: Malaysia**

Trends in female STEM majors are very similar across many Western cultures: U.S., Canada, Europe, Australia and even Israel. When looking at the paramount example majors of IT and computer science, Malaysia has managed to buck this trend. Othman and Latih's 1998-2006 study provides insight into this phenomenon.

Most of the studies take place in Western cultures. Australia, for example, is geographically closest to the focus of this study, Malaysia. In Australia, the estimated "ratio of females to males in IT is 1:9." (Symonds 2000) However, in Malaysia, the

exact ratio during the eight year period was 1096:984, essentially equal but slightly favoring female students. Only at the Ph.D. level does this phenomenon reverse. In fact, even the attrition rate (withdraws and failure) is higher amongst men (111). "When asked if they will work in CS/IT industry upon graduation, 44% of the females strongly agreed compared to only 29% of the males." (113) So, a look at this particular Eastern culture provides a useful comparison against which to compare other cultures with underrepresentation of women in CS.

First, we must look to see what other factors are similar and dissimilar to previous findings. To level-set, it was determined students had similar mathematic grades and household incomes. Then, looking at similarities, this includes pre-college abilities. Men rated themselves as more familiar/competent for example with operating systems, programming languages and applications (112-3). (These skills, however, were not tested, so one could question the influence of confidence in abilities.) Programming grades were similar.

Some differences to previously observed trends also emerged. In Malaysia, women had a stronger affinity towards math. "While the lack of female role models or mentors in the field has been cited as a demotivating factor for female students in the U.S. and Europe, this is not a problem for Malaysian females". In fact, even the dean of Faculty of CS and IT at the University of Malaya was a woman. "Of the faculty lecturers, 61% are female as are 73% of the Ph.D. holders." (114) These differences merit further study to see whether the Malaysian specific culture (or even Eastern versus Western culture) is a primarily influence in increased female CS/IT majors, or could it at least be positively influenced by increased female faculty/role models (somewhat of a chicken and egg argument).

Another interesting conclusion of this study is its support of Marolis's earlier study that "time spent at the computer is not a measure of how one performs academically". (114) While I am not arguing that finding, I would ask if this affects choice of major or confidence. The current study only surveyed CS/IT majors, so it is worth investigating if not pure ability, rather the confidence gained by experience, can be a determining factor in matriculation of female CS/IT majors.

## RECOMMENDATIONS: K-16

I believe it is in the best interest of educators and industry to remove barriers from female-entry into STEM, particularly technology careers. Perhaps this will not lead to a 50:50 split; leveling of the playing field will at least progress.

Teachers need awareness of unconscious biases displayed in the classroom. I recommend they get the "Gotta Have IT" resource kit for teachers ("New Alliance…" 2007). Or, there is a free download from www.meac.org called "Seeing Gender: Tools for Change." It introduces the research on how males and females experience education differently and is funded by National Science Foundation. (Spears 2008) Hopefully, awareness will decrease the occurrence.

Girls should gain confidence by increased exposure to "lab equipment". If a girl has a problem, make sure to step her through it and not take over or do it for her. If one lab partner always grabs the equipment first, have the students alternate roles. A study on high school chemistry or computing classes would be good follow-up research, since this has already been a proven technique in CS called "Extreme Programming".

### Extreme Programming/Pairing

Once girls are enrolled STEM classes, using pairing will improve their chance of success. In computer science, for example, classes using the Extreme Programming (XP)

method of pairing, showed improvements for both men and women. XP is a software development technique described as:

> the use of pair programming by all programmers, regardless of experience...two programmers work simultaneously on the same design, algorithm, code, or test...one member of the pair is the "designated driver," actively creating code and controlling the keyboard and mouse. The "non-driver" constantly reviews the keyed data…After a designated period of time, the partners reverse roles. Code produced by only one partner is discarded, or reviewed collaboratively before it is integrated. (McDowell 90 2006)

McDowell's study focused on 4 sections from 2000-2001. There were no differences in the SAT-M scores across the sections. It included 554 students from the University of CA—Santa Cruz. Students tested independently. The findings present a strong argument to increase the use of pairing.

In classes where pairing was used, 10.4 percent students persisted through the final exam. Pairers were only 1.4 percent more likely to pass the final exam, which was not statistically significant. However, this still shows support for pairing, after further analysis. Since testing was done individually, it means that the higher grades were not just the result of "free riding". "Williams and Kessler have proposed "pair pressure" as a possible explanation for higher completion rates among paired versus unpaired students...not supported by this data." (McDowell 93 2006)

Students who passed continued in the study. Significantly more paired students continued to the next programming course. For both men and women there was an increase of 18 percent, although women ranked lower than men in both groupings. (93). The next class required students to work individually; yet, paired students passed Data Structures 65.5 percent on their first attempt compared with 40.0 percent of unpaired students. Once again, students who were paired were able to prove (later) their individual abilities.

Of those intending to major in computer science, the paired students were more likely to have declared a computer science-related major within one year of completing the introductory programming class. This was true for both men and women. For women, we see more than one hundred percent improvement (59.5% vs. 22.2%)! Even women who did not initially plan to major in CS showed great statistics of 46.3 percent vs. 11.1 percent declaring a major in CS.

Not only did pass rate improve, but better programs were created. Once again, there was no significant difference found in the final examination grades.

> This finding strongly suggests a student's ability to independently apply concepts to novel problems is not compromised by learning to program in pairs. Indeed, considering that a significantly greater percentage of the students who paired took the final, it seems that learning to program in pairs results in mastery for a greater percentage of students." (94)

Possibly another positive influence on retention is the increased enjoyment resulting from pairing. On a scale of 1-7, with 7 being the best, paired students gave the assignments an average of 5.15 compared to 4.69. They were also more confident in their program solutions (87.0% vs. 81.1%). Confidence was raised for women (63.0% to 86.8%) and men (74.6% to 90.3%). Even though women's confidence remains lower men's, it is encouraging that women had a 23.8 percent increase. Men had a 15.6 percent increase, thus narrowing the gap to only 3.5 percent difference in favor of men's confidence. (95)

**Camps**

Another way to give girls hands-on experience is through the handful of demonstrations and camps that have cropped up recently. I have personally been involved in a girls-only camp run by I.B.M. EX.I.T.E. (EXploring Interests in Technology and Engineering) camps vary across international sites, but are typically a

week long camp on the I.B.M. campus. They reach about 1,600 girls a year, and it is in its tenth year. ("IBM…")

After camp, girls are each paired with a female mentor for at least an entire school year. They correspond via a web interface every week and occasionally have face-to-face meetings. Mentors provide a specific example of how women succeed in IT and also provide encouragement. Have the students involved in such camps actually gone on to pursue STEM fields at a higher rate?

**Mentors, Role Models and Professors**

The influence of role models may be hard to quantify. However, the fact that "students who had taken a required CS course were much more likely to know someone with a CS degree than were other students" (Beyer, et. al 25 2004) suggests this is an area for improvement. Perhaps knowing someone in the industry undoes the influence of inaccurate stereotypes, such as lack of human interaction, or makes them think, "if they can do it, I can do it" to overcome the perception of difficulty.

Both schools and industry should reach out to students to show them STEM careers are a great option them. Hearing firsthand experiences of a successful team effort may inspire those with a more people-oriented (as opposed to machine-oriented) personality. Role models that use STEM to help others would be particularly helpful. Perhaps teachers could have an engineer come talk about how she works on alternative energy. Also, a chemical engineer could talk about doing research to cure illness.

The best "role models" may be female teachers and professors. "[W]omen are more influenced in their course-taking patterns by teachers and counselors than are men." (Beyers et. al 22 2004) They can have a profound influence on letting women know they can succeed at the highest levels of education. Since there are few, perhaps colleges could give freshmen some say in the assignment of their advisor. If there are few female

students, it may be possible to pair them with a female professor. I would encourage any advisors to meet with any students who are moving away from a STEM major. For example, if a female student decides in her sophomore year to stop taking CS, maybe the advisor can make sure that it is truly what she wants and not just an unwarranted lack of confidence. If professors realize there is a steeper learning curve for many freshman women, but that they end up making similar grades, it is necessary to make sure women don't "give up too soon" for the wrong reasons.

This can start earlier with high school teachers and counselors. Girls that are seen to excel and math and science should not just be treated as hard-working. Teachers and counselors should urge them to at least consider engineering fields. If they are interested in an industry of which they know little, the school could help find a local mentor.

High school CS teachers can also join the Computer Science Teachers Association. Surprisingly, this group was only formed 3 years ago (2005). "Computer science was the only academic discipline within the U.S. high school curriculum without national professional representation." (Patterson 26-28 2005) As teachers learn support and learn from each other, hopefully the high school computer science curriculum will improve, leading to increase skill and confidence before college entrance.

# Chapter 3: Barriers in Career

## RELEVANT U.S. LABOR LAWS

It is hard to believe it was less than ninety years ago when women were given the right to vote via the nineteenth amendment to the U.S. Constitution in 1920. (Women's Suffrage) The U.S. labor laws have greatly changed over the last century to protect women (and men) from unfair treatment.

In the 1960's, the law saw many changes. First came the Equal Pay Act, of which a portion of the act follows:

> SEC. 206. *[Section 6]*
>
> (d) Prohibition of sex discrimination
>
> (1) No employer having employees subject to any provisions of this section shall discriminate, within any establishment in which such employees are employed, between employees on the basis of sex by paying wages to employees in such establishment at a rate less than the rate at which he pays wages to employees of the opposite sex in such establishment for equal work on jobs the performance of which requires equal skill, effort, and responsibility, and which are performed under similar working conditions, except where such payment is made pursuant to (i) a seniority system; (ii) a merit system; (iii) a system which measures earnings by quantity or quality of production; or (iv) a differential based on any other factor other than sex: *Provided*, That an employer who is paying a wage rate differential in violation of this subsection shall not, in order to comply with the provisions of this subsection, reduce the wage rate of any employee.

Despite this law, the wage gap remains at 76.6%. (Hartmann, 2004) There are differences in work patterns, but men still make more than women with comparable experience and comparable hours on the job. (U.S. GAO, 2003).

Next came the Civil Rights Act, also known as Title VII. This allowed for the creation of the Equal Employment Opportunity Commission (EEOC) in 1964. Section 703 (a) states it is illegal to:

> fail or refuse to hire or to discharge any individual, or otherwise to discriminate against any individual with respect to his compensation, terms, conditions or privileges or employment, because of such individual's race, color, religion, sex, or national origin.

The act originally did not include 'sex' but was added by Representative Howard W. Smith (D-VA). This move was controversial. Rep. Smith claims it arose from his work with the National Women's Party, but skeptics felt he was trying to kill the entire bill. ("Teaching with Documents…")

Later, the Civil Rights Act was made stronger, more recently in 1991. Now plaintiffs have the right to a jury trial, with higher possible damages. Also, when discrimination is proven to be intentional, punitive damages may be awarded. The Glass Ceiling Commission (Title II) was also established in order to:

> focus attention on, and complete a study relating to, the existence of artificial barriers to the advancement of women and minorities in the workplace, and to make recommendations for overcoming such barriers. The Commission is to be composed of 21 members, with the Secretary of Labor serving as the Chairperson of the Commission. [42 U.S.C. 2000e note]
> (The U.S. Equal Employment… 2004)

The federal government forming this commission sets a standard, similar to how it set the standards for those who were disabled. Then, industry is more likely to take notice.

The Family and Medical Leave Act (FMLA) came in 1994. While it is not specific to gender, it has an especially great impact to mothers. Employees get up to twelve weeks off—unpaid—after pregnancy, adoption or medical emergency (with some limitations). It is required only for private employers employing 50+ employees. Imagine prior to this law, a woman giving birth then only having her normal vacation time until having to return to work or risk job loss. Again, remember, this law does not apply to all U.S. companies and is only fifteen years old! (The U.S. Equal Employment… 2000)

The FMLA actually appears weak in comparison to policies of other industrialized, Western countries. For example, compare its twelve weeks with forty weeks in the United Kingdom. Also, compare its unpaid leave with up to 100% paid leave afforded in the Netherlands and Germany. (Alewell & Pull)

Just this year, a new equal pay law was signed. In fact, it was the first bill signed into law by President Obama. (A similar bill was presented without success during George W. Bush's presidency.) The Lilly Ledbetter Fair Pay Act is inspired by Ms. Ledbetter, a retired Goodyear employee. She discovered, near the time of her retirement, that she was making less than male colleagues. She took the matter to court. The final ruling was by the Supreme Court; they found that the statute of limitations had passed. However, the new law, allows six months on the statues of limitations after **each** paycheck, instead of after the first infringing paycheck. Ms. Ledbetter is not getting any damages, but she has paved the way for others with wage disputes. (Stolberg)

**ROLE OF MANAGEMENT, LEGAL**

Managers should keep abreast of the above laws. Non-compliance is not only bad for the relationship with the team member, nor is it only the *right thing to do* ethically. It can carry hefty penalties for violation of the law; many are in the range hundreds of thousands of dollars. One was lawsuit was over ten million dollars! Below are some cases taken from www.worklifelaw.org. (Williams & Segal)

At least two such examples take place in technical companies. First, a female civil engineer was asked by her president, "Do you want to have babies or do you want a career here?" She was awarded $3MM (later overturned). Second, in Walsh v. National Computer Systems, Inc., Walsh has claims under Title VII and FMLA. She was disparate treatment and a hostile work environment after returning from maternity leave.

> [T]he plaintiff was subjected to differential treatment including increased work, increased scrutiny of work, loss of schedule flexibility granted to others in her department, demeaning comments regarding potential future pregnancies and her young child, and violent reactions to requests for lawful family and medical leave.

She was awarded $625K.

Another case also relates the Americans with Disabilities Act (ADA), and shows discrimination against the female caregiver. In one case, the woman was transferred to another job role after giving birth to a disabled son. In another, the woman was not hired due to assumptions of competence.

In fact, from a study forthcoming in the *Journal of Personality and Social Psychology*, by Susan Fiske, Amy Cuddy, Peter Glick, and Jun Xu, women themselves are viewed as if disabled after becoming mothers. (Williams & Segal) Such competence assumptions are seen by comparing "business women" versus mothers. The former was seen as similar to "businessmen" and "millionaires" while mothers were seen similar to the "elderly," "blind," "retarded," and "disabled."

While most cases have had female plaintiffs, it is important for managers and companies to treat everyone equally, not just to protect women. This is seen when a male employee successfully sues in *Knussman v. Maryland.* In this case, a male state tropper was denied request for "nurturing leave as the primary caregiver". He was told:

> God made women to have babies and, unless [he] could have a baby, there is no way [he] could be the primary care [giver].

Also, he stated his "wife would have to be 'in a coma or dead' for him to qualify as the primary caregiver." (Williams & Segal)

**CAREER HISTORY**

Next is a look at career experiences for female 'techies', especially those who become mothers. In "Career and Motherhood in Engineering: cultural dilemmas and individualistic solutions", fifteen women participated via the careers history research methodology. Their individual experiences were collected, and "the similarities and essential differences in their experiences of career" (Evetts 178) were then outlined and analyzed. Evetts uses the concepts of career identity as well as interactionist theoretical principles. The perspective gained is eye opening, since she works "to consider the ways in which the women were active in managing rather than merely passively adapting to cultural expectations and structural constraints." (178) While the proactive stance of the women is helpful, Evetts also recognizes they were only "partial solutions to on-going cultural dilemmas." (179)

The participants were 15 women of which 7 were already mothers. One was pregnant. Of the remaining seven, 3 intended to have children and 4 did not. "Their identities were focused on their engineering careers." (179)

All of the women choosing not to have children were successful in their careers. This way of balancing (lack of) motherhood and career was more difficult for some than others. Evetts notes that men and women are rewarded for 'single minded dedication' but cutting out family and personal commitments; however, career men still do not face the same choices. (180)

Those who combined their careers with motherhood reconciled these two roles. One mother, Ann, was the first mother to negotiate part-time working in a 'traditionally male company'. (180) She was encouraged to do so by her husband but faced a lot of resistance; it took about six months to get approved.

Others in the survey were able to negotiate some part time work, but overall they felt pressured to return to full-time work. Also, many saw inconsistencies in policy execution, based on the approving manager.

This is similar to findings in the study done by Jones and Causer. Even companies with formal maternity policies make line managers "crucial in determining individual women's *exact* terms for returning to work." (57)

> Personnel managers both acknowledged that individual deals were done and recognized that some managers were likely to be unsympathetic. The fact that women have to negotiate *individual* deals further confuses women for whom children are a possibility rather than a reality. (58)

Returning to Evetts's study, a mother named Anita found out she was unexpectedly pregnant with her third child. She had been able to juggle two but did not feel she could handle the same with three children. During this time, she found out about career breaks from her union, of which she chose to take advantage. An interesting consequence of this benefit was additional pressure on Anita. She felt if she did not perform well that it would impact other women in the company, and they might do away with the career break option.

Another view was taken by Alice. She believes women should position themselves so it is in the *company's* best interest to keep you, such as when you have a lot of expertise in your area. If technical women wait to be established in their careers, this could be another factor in limiting the number of children they will have. Assuming the women stay at the same company during this time, it is ironic that this delay could actually cost the company more in the long run. They will have a more experienced person out on leave. Plus, those companies/countries offering some employer pay during maternity leave would likely pay a larger amount, based on salary progression.

To all of the women in this study, regardless of motherhood choices, their professional identity was a big part of how they see themselves. Evetts sees it as "very important in their personal identities and in their feelings of satisfaction and self-worth." (185)

**WOMEN AS DEVIANTS TO THE (MALE) NORM**

Jones and Causer states that women "continue to be seen as deviants from [the male] norm, whose family commitments are likely to adversely affect work performance or commitment". Therefore, rather than looking at policies as opportunities for broader equality, they are seen as "a concession to the deviant status of women in general and mothers in particular". (51)

Their research focused on 60 women in ten electronics and aerospace establishments in central southern England. Companies varied in size. Also, management and personnel representatives were interviewed from these same ten companies to learn more about the company's policies and practices.

One two of the companies had 'career break schemes'. Company 'C' gave, on a discretionary basis, unpaid leave. Company 'F' gave up to twelve months of unpaid leave for those employees with "*ten or more years' service*" (emphasis mine). For most women, this puts them at 32 years or older. For some women, delaying pregnancy until their ten year anniversary could even pose additional (health) risks.

Further, two companies had formal policies for part-time work after childbirth. At both 'A' and 'B', it was another policy that was at the *discretion of the manager*.

In almost all of the study participants, a paid nanny was used. Company sponsored daycare was sometimes considered, but it was typically just seen for professional women, as opposed to all staff. When a female engineer raised this issue the response was 'well we haven't got enough women on site to warrant it.' (54) For

example, it was treated as if men would not utilize such on-site facilities. "It is assumed (because it is frequently the case) that professional men have someone at home who care for them and for their children." (54) The authors go so far as to compare the views of parenting as female only was acting like the children were produced by asexual reproduction! On the other hand, what could be considered 'reverse discrimination' seems to go unnoticed by male employees. At company 'B':

> [F]emale professional staff [are given] a 25% increase in salary for two years after childbirth to assist with child care costs. (53)

As a result of inconsistent policies (if any such policy exists) as well as 'deviant status', technical women began using informal networks to gather maternity information. They sought out others who were like them proceeding to get advice from mothers on work schedules and child care. (57) Considering the lower percentage of technical mothers, one could assume it is unlikely that the 'mentor' would be in the 'mentee's' department. Therefore, frustration could result when previously negotiated terms are brought to a new/different manager. Companies should work to alleviate dissatisfaction from perceived inequality of referents (other mothers).

**Comparative Analysis: Israel**

Many of the studies found were on the U.S. and the U.K., and there similar patterns emerge. How big does the role of culture play in these trends? In the 1980's, Bailyn and Etzion comparatively analyze U.S. and Israel. (In a later article, Nicolauo-Smokoviti joins in with additional analysis on Greece.) It is fascinating to see which themes are universal and which ones are culture-specific. As a more diverse set of countries are studied (especially non-Western), it should provide additional insight into solutions, especially to the universal barriers.

Their questionnaire focused on the following topics: job characteristics, importance of job characteristics, self-assessment, career/family involvement and interaction. Also 'well-being' was assessed by burnout, enjoyment and depletion. (12)

Initial evaluation shows that American women are more conflicted between family and career than are Israelis. Those with 'high conflict'—defined as over 5.0 on a scale of 7—make up 26% of the American sample but only 15% of the Israeli sample.

The authors compare the groups, and also further break them out by marital status and motherhood status. (See table 1.) Mothers are further broken into two groups based on children's age (older or younger than 6). The following characteristics are then analyzed: career and family conflict, burnout, enjoyment, and depletion. The data represents the percentage of women with worst rankings.

On all points, the unmarried Israeli women appear to be worse than their married counterparts. (Only 15.91% are unmarried.) The authors feel that this is an older, more established group of women who "seem to be stuck in this life condition". (27)

American women show more variety on which demographic is most negatively ranked. The worst burnout and enjoyment are unmarried women. Tied for burnout are mothers with young children. Finally, married, childless women show the worst percentages for career and family conflict and depletion. One possibly theory is that they are putting their career ahead of their health and motherhood status, by being single-mindedly focused on their careers. Though, they do show good rankings in enjoyment and burnout, so perhaps they are happy in their careers but occasionally feel torn about not having children.

Overall, mothers with older children show better ranks than do mothers with younger children, as anticipated. Also overall, Israeli mothers show better ranks than their American counterparts.

# Chapter 4: Independent Empirical Research

## METHODOLOGY

The primary research portion was collected via on-line survey in October of 2009. The survey targeted technical female respondents who were solicited to participate via email and a networking website. Snowball sampling was encouraged to increase the diversity of respondents though this method limits the ability to calculate percentage of final recipients who responded to the survey. In order to reduce social desirability effects and allow greater honesty in their responses, participants were informed that their responses would remain completely anonymous; for example, respondents were not asked to identify their company name, email address, et cetera.

The survey specified a targeted population of Indian and U.S. American technical women (by birth and by current residence). However, other respondents were still able to participate if desired. The total number of respondents was 123. Of these, only four were men. All respondents reside in the U.S. or India, and all but nine were originally from the same. (One person skipped this question.) The breakdown of residency included 19 respondents currently residing in India versus 109 in the U.S. Country of origin showed a more even sampling with 35 from India and 78 from the U.S.

Respondents ranged in age from 22 to 67. The mean age of all respondents was 36.63 with a median of 34. Also, while there was diversity in relationship status, the married (heterosexual) were the majority with 60.7% (74 out of 122 responses).

Motherhood was defined in this survey not just as biological motherhood. Those who had adopted, biological or stepchildren made up 56.4% of those who answered the question. (57 mothers; 22 skipped this question) Out of the 54 women responding to this question, 52 had biological children, with an average of 1.71 biological children.

Stepchildren make up the next largest group with a 2.00 average for those (five women) that are stepmothers. Finally, one person adopted one toddler, and no one adopted an older child. Unfortunately, the (non-biological) sample size limits analysis of these categories for differentiating trends on the other axes.

Not all questions required answers. Further, not all questions were seen by all respondents. Logic was added to the survey such that only mothers saw questions 25-28, which were specific to mothers. (See appendices A.25-A.28.) Of the questions everyone saw, the lowest rate of response was the final question, which was freeform/essay-style. (See appendix A.31.) Otherwise, response rate was generally high with the lowest response rate being 79% (97/123). Generally, the response rate decreased as the survey progressed, which may suggest impatience with the survey length. However, the survey was only thirty-one questions (less for those without children). It may be more likely that the questions became increasingly more 'personal' in nature (less demographic, more opinion and feeling based) contributed to lower response rates.

### QUALITY OF LIFE: ENJOYMENT, BURNOUT, AND DEPLETION

The survey also looks at levels of enjoyment, burnout and depletion. After reading Etzion's and Bailyn's study, these axes really stood out and were thus included in this survey. (Though, the original questions were not available to me when the current study was designed.)

First, enjoyment was measured by asking respondents to rate on a 7-point scale (1 "Not at all" through 7 "Extremely). "How much do you enjoy your job/career?" No respondents selected 'Not at all' and the most popular category for the women was a five out of seven. This was also the most popular category for mothers and non-mothers, individually, with both groups having similar averages (~5.3). Though, the lowest rank was a 2 and only ranked by one mother.

It may be the case that mothers who took this survey are most likely ones who returned to the workforce after having children. So, it follows that overall they would enjoy their career, and the survey was less likely to reach those who decided to leave a technical career path. For example, the UK department of Trade and Industry's 2002 study looked at women with science, engineering and technology (SET). The women with degrees *and* children had a pool of fifty thousand who were unemployed, 25% of the population. (Wallon)

Would the enjoyment trend continue with burnout and depletion? Unlike Etzion' and Bailyn's study that used the Pines and Kafry 21-index for burnout, in this study burnout was measured by a single index. This was shown to be a valid measure in Rohland et. al.'s research. The reduction of overall questions (as well as percentage of questions on burnout) seemed appropriate in the context of the survey audience and methodology. Therefore, the following question was used:

*Please classify your level of burnout based on your own definition of burnout.*

The scale from Rohland et. al. was similarly used, with 5 ranks. (See appendix A.15.) Rank one and five, respectively, were described as:

*I enjoy my work. I have no symptoms of burnout.*

*I feel completely burned out often and wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help.*

The overall mean was 2.44, and rank two also saw over half of all responses:

*Occasionally I am under stress, and I don't always have as much energy as I once did, but I don't feel burned out.*

Next, the burnout was analyzed against motherhood status, with an anticipated higher level of burnout for mothers. Mothers saw a slight increase to 2.59 versus 2.30 for their peers without children. Also, no non-mothers selected the highest level of burnout

while two mothers did. Similarly, the next-to-highest rank shows mothers with almost four times the percentage of non-mothers.

Depletion is related to burnout but is more physical and less psychological as defined in this study. Therefore, it was explored via three physical measurements, broad and self-assessed: amount of energy, sleep quality and physical health. Over all the groups and indexes, ranks were generally four to five out of seven.

In all three cases, mothers showed more depletion (lower ranks). The most significant difference was in sleep quality (3.88 versus 4.68, with 4.00 being neutral). This is unfortunate for the mothers, but luckily the lower sleep quality does not appear to have proportionately affected their energy and health!

### GENDER AND WORK IDENTITIES: SEPARATION AND CONFLICT

The survey also looks at levels of separation and conflict between a woman's identity as a woman and as a technical employee. (See appendices A.16, table 3.) Out of the eight questions, mothers were worse than non-mothers on all but two, which were 'neutral'. They had less than 0.1 difference (on a scale of 1-5):

> I feel conflicted between my identity as woman and my identity as a technical employee.
>
> Succeeding as a technical employee involves the same sides of myself as succeeding as a woman.

The biggest division is .72 (3.73 vs. 4.45):

> I do not feel any tension between my goals as woman and my goals as a technical employee.

If you take the delta of each groups' mean, then average them, 0.41 is the average delta.

Next, the respondents were asked to evaluate these factors over time. First, they compared their experience five years ago to their current experiences. (See appendix

A.17.) Then, they were asked to anticipate the difference with five years in the future (See appendix A.18.)

Both questions saw similar answers between separation and conflict. Also, both mothers and non-mother females had similar responses. All saw the highest responses on 'No Difference'. All means were also very close to 'No Difference' (3 out of 5). Based on this lack of contrast, could there be a difference as women change status from non-mothers to mothers?

For example, if you were a mother 5 years ago, would your answer change drastically if all else also stayed the same? There were twenty respondents who had children, where all children were less than 5 years old. All of these children happened to be biological. When filtering just women who were not mothers 5 years ago, but are now, a marked difference emerges. These women scored 2.29 out of 5 for both separation and conflict. Further, the most popular categories were the most extreme cases of '1' (and one tie with a '2') showing more separation and conflict than 5 years ago. None of this group of mothers selected 'Much More' separation and conflict when comparing to pre-motherhood. This shows that *entry* into motherhood is a remarkable period for both increased separation and conflict.

### ALL IN THE FAMILY: CAREER CHOICES OF FAMILY MEMBERS

The article by Etzion, Nicolauo-Smokoviti, and Bailyn mentioned respondents having husbands and fathers who were also in a technical field. I have casually observed this trend as well with female, technical coworkers. So, the survey attempts to more formally investigate this trend.

Respondents are asked about their spouses' or long-term partners' career field. (See appendix A.6.) Ninety-four women had partners or spouses currently employed. Of this group, approximately 80% had partners who were also in a technical and/or

engineering field! Further analysis of factors leading to this phenomenon could be very interesting. For example, was it truly similar personalities, or were career demands a factor?

Further, the survey asks if any family members are also in a technical or engineering field. (See appendix A.11.) Only 33.0% said 'none'. The results do show a marked difference in female role models. A significant portion of women have fathers in these fields (28.6%) but only seven total women have mothers in these fields (6.3%). There were even eight grandparents in the ranks: six grandfathers (5.4%) and two grandmothers (1.8%).

Some of this may be generational, but a similar trend is seen in brothers and sisters. (I assume the respondents, overall, have roughly proportional numbers of brothers and sisters.) Those checking 'brothers' made up 33.9% compared with 11.6% checking 'sisters'. Total respondents marking 'other family' were 25.0%.

### RESPONDENTS' CAREER AND FAMILY INVOLVEMENT

Career involvement and family involvement were each ranked. Then, the conflict between these two was also ranked (See appendices A.12-13a). Overall, differences between mothers and non-mothers were present, but not extreme, and sample sizes were also close in size.

Mothers and non-mothers were close to equal on career involvement with about 5.7 out of 7 on average. With seven representing 'extremely involved', both groups had their highest grouping in rank six and seven.

The groups start to diverge on family involvement, with the expected result of mothers having a higher score. Out of 7, mothers most often ranked 6.52 and non-mothers ranked 5.44. While all ranks were used by non-mothers, no mothers ranked

themselves below four (interpreted as neutral), and even this was only ranked by two mothers or 3.6%.

Overall, the groups showed high career and family involvement, so did this lead to a high level of conflict between the two demands? The group was asked:

*How conflicted do you feel between your career & family involvement?*

The scale went from one being 'Not at all' to seven representing 'Extremely'. Mothers averaged 4.83 versus non-mothers at 3.53. Both groups had a good spread across the seven ranks. However, the mothers had the most responses on ranks 6 and 7 (22.2% each), while the largest grouping for non-mothers was rank 4 (neutral, 30.2%).

**MATERNITY LEAVE**

The mothers were asked how long their maternity leave was. (See appendix A.27.) First, how long were they gone until they returned part-time. The answer average was eight months, but this appears to be skewed by 2 answers of over 4 years. The return to full-time was actually closer to 5 months, but again there were 2 respondents with atypical responses of over one thousand days.

Why the longer response time for part-time return? The question anticipated women may return part-time then full-time. However, it is clear from the answers that at least 2 women never returned full-time, as their answers for part-time are higher than theirs any for full-time. Also, it is possible that the respondent put the delta from part-time to full-time rather than the total time to return to full-time.

Either way, I think it is interesting to see the range of answers. Total answers ranged from zero days to seven years. This goes to show that there is not a "one size fits all" in maternity leave and managers should limit their assumptions on desired leave.

Due to the data ranges, the median might more appropriate than mean. Time until returning to 'some part-time work' was two months and three months until full-time work.

**BREASTFEEDING**

The mothers were asked about experiences related to breastfeeding. First, the survey asks how comfortable she was in researching or discussion breastfeeding options (See appendices A.28, A.30). Second, her actual experience breastfeeding while working was ranked. Both questions were on a five point scale from very uncomfortable (1) to very comfortable (5). (N/A was also an option.)

The experience was fairly well-distributed across the scale, and the mean for both ended up being 'neutral' (3.10 and 2.96 respectively). Focusing in on those worse than neutral, there are one-third of those while researching and four-ninths while actually nursing. Those who were 'very uncomfortable' made up 13.3% during research and 25.9% during nursing.

Further, what are the pumping options for female employees? This question was posed to all respondents, regardless of motherhood status, though only females choose to answer. Respondents were allowed to select more than one response. (See appendix A.30.)

The most popular (assumed) pumping location was her office (34.7%). This was closely followed by a restroom and a lactation room (near her office). Eleven women (11.6%) thought the mother would most likely stay at home during this time. Less ideal solutions were in her car (6, 6.3%) and a far away lactation room (4, 4.2%).

Finally, this question allowed for freeform responses. (See A.31.) Under this 'other' section, two respondents further described the special accommodations given by the employer:

*There is a private room with a couch connected to the bathroom but separated by a door with an "Occupied" sign. –*

*[The] company made sure she had a closed-wall office with a door and do not disturb sign.*

Another perspective was provided by a respondent who was also a mother:

*She would pump at home before and after work and on weekends.*

This strategy would be more convenient when possible, but this is not a possibility for all women based on when they return to work and how often they need to nurse/pump. For example, a woman returning to work eight to five o'clock may need to pump every two hours, so this option would still need to be accommodated by her management.

An example of this conflict is also described in "No Longer 'One of the Boys'". During the study interview, a woman named Carla is the bread winner in her family. After returning to work, she planned to nurse during her lunch hour.

*Well, I tried it for two weeks, but then my milk supply was so big, it was just like…you know here I am a professional engineer and my boobs are leaking all over the place and I just couldn't, couldn't do that.*

When asked if coworkers were supportive, she replied:

*Well, I didn't really talk about it with anybody. It was kind of a private thing.*

The author points out the incongruity faced by women who feel like this is 'private', yet they are back in 'public' returning to the workforce (p. 161).

**PERCEPTION OF MOTHERS' CHOICES**

In both the study and in literature, women generally feel internal conflict during motherhood or the decision on whether or not to become a mother. Interestingly, though, others are unlikely to negatively judge their choices, so they may have more external support than they realize. Alternatively, could they be unaware of how they are reacting to others and unaware of any prejudice?

Such mothers' peers were asked, in this survey, how they judged mothers' choices. (See appendix A.29.) Overall, the women were not negatively judgmental towards the choices of (other) mothers' in their fields, specifically in regards to:

*Have you ever (negatively) judged their motherhood/career balance?*
*Have you ever (negatively) judged their maternity leave decision(s)?*

For both questions, the most popular answer was 'never' (45.8% and 70.5% respectively). Mothers basically show the same trend but are slightly more judgmental of motherhood/career balance (51.9%) and slightly less so of maternity leave (68.6%).

In respect to career balance, all five answers were selected at least once, even by the mother-only analysis. The average was 1.96, with 2 equating to 'rarely' judging. Similarly, all five answers were selected at least once for the question on maternity leave. However, this time no mothers selected 'often', though one did select 'very often'. The average again was closest to 'rarely' judging (1.51). This shows that there is not a drastic difference on judging mothers in the general female population versus just those that are already mothers, which lead me to think about those who were not mothers, and sure enough they followed similar trends. So, perhaps technical women can feel a level of solidarity and also feel more confident in their choices based on this data.

**COMPARATIVE ANALYSIS: INDIA**

The next section describes the trends and differences amongst and between the American and Indian resident respondents. First, diversity amongst Americans' birth country was observed while all female India residents were originally from India.

Out of the 119 total women participated in the study, 101 were American residents and 18 were Indian residents. (Total born in India was 34, 16 of whom now reside in America. These 16 will be grouped in the broader Americans and also specified as Indian-Americans). (See table 3.)

One of the first differences discovered involved career and family involvement. (See appendix A.12.) Indian and American women rank family above career, but there is more emphasis given by Indian women; the delta in involvement is 0.94 versus 0.29. Further, Indian women overall rank family higher than do American women (6.27 vs. 6.03 out of 7). No Indian women ranked family involvement as lower than neutral, while all categories were marked by American women. (Granted, the India sample size is significantly smaller.) American women rank career involvement higher than do Indians (5.74 vs. 5.33 out of 7). When Indian-Americans are separated, they follow the overall trend and assign a higher rank to family involvement (5.80) than career involvement (5.53). They have lower career involvement ranking than overall Americans or Indians. Are their work patterns different or merely their referents?

It is notable that both groups found career and family conflict to be similar, with U.S. respondents as slightly more conflicted (4.00 vs. 4.25 out of 7). (This difference is unlikely to be statistically significant, since only 15 Indian women responded.) (See appendix A.13.) Indian-American women had lower career and family conflict (3.93)—more similar to India women.

Overall, American women showed worse depletion than did their Indian counterparts. (See appendix A.14.) The indicator 'physical health' was almost exactly equal. However, on both 'amount of energy' and 'sleep quality', India shows significant advantage. With seven being the 'high/best', Indian respectively rate them as 5.50 and 5.13; Americans respectively rate them as 4.60 and 4.13. Perhaps there are better support structures in place for these Indian technical women, such as familial support. Further, Indian-American women are close to the middle, trending slightly closer to Indians.

When evaluating separation and conflict amongst Indians and Americans (See appendix A.16.), three indices had the most notable contrast:

1. I keep everything about being a woman separate from being a technical employee.
2. Succeeding as a technical employee involves the same sides of myself as succeeding as a woman.
3. I do not feel any tension between my goals as woman and my goals as a technical employee.

These were measure on a 7-rank scale with one equal to 'strongly disagree.

India is only worse, of the above three, on the first index (3.73 vs. 2.69). The other two show marked advantages to India with 4.21 versus 5.07 and 3.91 versus 4.87. So, you can see that while women in India choose to keep separation, they do not see their ideals and goals as in conflict between those of women and those of technical employees.

When perceiving mothers' choices, Indian women were more likely to negatively judge the mothers' decisions (or at least admit to it!). (See appendix A.29.) Maternity leave decisions were judged slightly more frequently in India (1.77 vs. 1.46 out of 5). Motherhood/career balance judgment had a mean of 1.88 for American women versus 2.46 for Indian women. Both are closest to 'rarely' judging the balance negatively, but the Indian responses are much closer to 'sometimes' judging.

Finally, a broad contrast is present in expected behavior for those mothers pumping breast milk. (See appendix A.30, figure 1.) The most popular American response was that a mother would likely do so in her office (39.0%) while the least popular response was only 2.4% of respondents with the mother '…would probably stay home during this time'. In contrast, this option is by far the most popular in India with 69.2% of respondents. (9/13 who answered.) No Indian-American women (out of twelve) selected this response. This may indicate the local culture or human resource standards are more relevant than ethnicity in determining appropriate pumping behaviors.

## FREEFORM MOTHERHOOD RESPONSES

Though the survey was comprised mostly of questions with likert-type response scales or pre-defined check boxes for answers, in the last question participants were allowed to reflect openly on their personal thoughts/opinions in a free response essay box. Approximately half of the respondents chose to leave an additional comment in response to the prompt, "Please share any thoughts you have on motherhood and your career, whether or not you are a mother." The responses were diverse and often candid about personal experiences.

It is clear that women feel conflicted in their combined roles of family member and employee, both for mothers and those that are not mothers (see also p. 38).

In two quotes, the respondents specifically called out the technical career and culture in their responses. From the following responses, there is generally a sense that these technical careers are harder to maintain with family obligations.

> *The **technical** field generally involves long hours. This is where I find the most conflict between my professional role and my role(s) as a wife and mother. – (married mother) (emphasis mine)*

> *…if you do choose to stay home, returning to work can be very difficult because the **technology** has moved on and you have to retrain yourself. But even then, you are basically starting your career over and it's much harder the 2nd time around. – (married mother) (emphasis mine)*

Another theme that emerged was the influence of others, specifically the husband and/or father and the employee's manager. Interestingly, it is not only the mothers who felt they were at a disadvantage.

**Managers:**

> *…My manager repeatedly brings up the fact that I'm a single mom as an excuse not to promote me even though I miss less work than my married mom coworker or my male coworkers. After spending 5 days working from my son's hospital room, I was told that I need to "farm out" my kids "for awhile" and focus on work, in spite of the fact that all deliverables and obligations were met while I worked*

*from the hospital. Women are still not treated equitably, especially mothers. – (divorced mother)*

*I worked previously in an environment that was hostile towards women. I have since left and now work to promote women in STEM- the old employer is still somewhat hostile towards me. My replacement is preparing for maternity leave and has had a very difficult time. I am grateful to have escaped the situation and look forward to the manager's generation's impending retirement. It is a very sad situation. – (married, no children)*

*…Although, working mothers encounter [much] discrimination, women without children experience their fair share. In the past I have had managers expecting me to log more hours because I have 'less responsibility' and 'more free time.' I feel that that type of pressure can create a gap in personal and professional identity. Less time to develop myself as a person and management that views my time outside work as less important than my co-workers with kids… - (married, no children)*

*…if [parenting is getting affected] by her work than she should talk to her manager and come up with a better solution to balance her work-home better. – (single, no children)*

*I do not yet have children, but am apprehensive about my ability to balance my commitments. I work within a team that is primarily female, but know that my supervisor gets a little frustrated trying to work around maternity leaves and subsequent schedule limitations. >50% of the women I work with have children and two more are expecting now. I expect it to be difficult, but hope to be able to manage the balance. I did choose not to pursue some jobs because I believed that the job would interfere too much with my family life (now and in the future). – (long-term committed, no children)*

I have encountered such "reverse" discrimination in the workplace as well. For example, those without children are seen as "not having families" and asked to work holidays without having volunteered. Next, the role of the husband/father is mentioned.

**Husband/Father**

Three respondents mentioned the role of their partner in the balance of career and family:

*I'm a mother, and there's no conflict being a mom & a wife and a worker. Maybe it's my husband who makes it easy. – (married mother)*

*…The ideal situation would be that my husband's job would have flexible hours and I would cut back to part time. I would like to do this until my children are in school at which point I would like to go back to full time. – (single, no children)*

*The difficulty I experience is not conflict between demands of being a woman and career, but demands of being a parent and career (I believe that both parents should participate equally in parenting, so that there is not a difference between demands on me as a woman and on my husband as a man). – (married mother)*

*…To be successful in life you need to have strong support from your family especially your spouse. – (married mother)*

**Perceived Gender Disparity:**

The previous comment proves to be a unique view in the responses. More often, there is a feeling that there still is a gender disparity apparent between role of mother and father.

*I think that women continue to carry the largest weight of child care and housework, and therefore suffer more stress in trying to balance a highly demanding career and motherhood then do men. I think younger generations of men are changing this inequality. – (divorced mother)*

*Male management, especially those whose wives are stay-at-home moms still do not understand the positions that mothers are in trying to balance work and family, especially with sick kids. – (divorced mother)*

*…Unlike the typical man, most women choose to put their children and partners first and career second… - (married mother)*

**Concept of motherhood:**

Many of the freeform responses focused on the respondents' ideals about or concepts of motherhood.

*Growing up, I always expected that I would be able to stay at home and watch my children do the same, as my mom did and most of the moms in my area and generation did. Latchkey kids were a controversial…Now, I look around my office and see women who I look up to and respect working throughout their pregnancies and weeks after giving birth; sending their children to daycare from*

*infancy; and not leaving the office 'til late after I, as a child, would have been well-fed at a family dinner table with both of my parents. But at the same time I also find myself overly critical of the women who have the seeming-luxury of strolling with their toddlers and playing on playgrounds while I am on my way to work. – (long-term committed, no children )*

*I think that there it is important for women to be at home with their children, particularly during their formative years 1-3. As children transition into school, I believe that mothers should work part time, so at to be available to their children. When our children are grown or we do not yet have them, those are the times for us to be working full-time. I do understand that there can be exceptions to the above and the workforce needs to be flexible enough for us to do this. – (married, no children)*

*Motherhood is [the] most [important] part of a woman life so [I] feel she should sacrifice her [career] for a while for the kid. – (single, no children)*

*In this day and age, raising a family is financially tough. If a mother feels compelled to start or continue a career while raising a family, by all means, she should. – (single, no children)*

**Guilt:**

Regardless of the balance women, especially mothers, hopefully they are at piece with their decisions. While women have a tremendous amount of choices available to them, unfortunately some still feel guilty with the balance they have chosen.

*It is a balancing act between being there for your child and pulling your weight as an employee. The guilty feelings are constant. – (married mother)*

*It is difficult to balance, feel guilty for spending time on family instead of work. – (married mother)*

*[It's] a big challenge, amidst politics in office and feeling guilty at home – (married mother)*

# Chapter 5: Future Directions

While the results from this study provide a firm foundation from which to begin contemplating the strain of motherhood on women in technology, future studies could both address some limitations in the current design and extend the findings even further. In regards to the study format, it might be useful to make more of the questions required. Also, there could be an option to provide contact information if the respondent is willing to do a follow-up interview.

For those that are mothers, involvement of the father (if any) could also be investigated. Also, there may be other familial obligations that are not children-specific. While overall family conflict is examined, this may be an area for further examination. As the population ages, we may increasing numbers of employees (even childless employees) having a great family conflict while caring for their aging parents or other relatives.

Further, additional demographic considerations may prove useful. For example, in both countries attitudes may vary based on region/state and also religion. Compared to Etzion's and Bailyn's study , it could be argued that a freely distributed (on-line) survey in 2009 within India and the U.S., respectively, would likely get a more demographically and culturally diverse set of respondents than the study in Israel (1987/8) and the U.S. (1985/6) conducted via paper survey (11). Those who are more traditional in their spiritual beliefs may be influenced in their view of their familial role.

Finally, seeking out male input would provide a more thorough comparison. If more men are taking primary caregiver responsibility, this could be an explanation of shift in attitudes. Would men have the same reactions as women; and what factors are truly (socially and personally) unique to women in primary caregiver positions? To a

lesser degree, this concept was considered by the delineation of motherhood categories (biological, adopted, etc.). This helps to isolate what factors are influenced by the biology of motherhood (morning sickness, breast feeding) versus the role of mother as the caregiver.

# Chapter 6: Recommendations for Professionals

## RECOMMENDATIONS: EMPLOYEES

Employees should proactively understand their rights and company policies. It is easy to only get education through human resources. Unfortunately, others might only research their rights (such as federal laws) only after some incident has occurred. The employee should not overly rely on HR or their manager but instead be knowledgeable about relevant workforce laws, such as FMLA.

Similarly, it is best to research a company's HR policies before you join the company, if possible. If they are a large corporation, are they listed on the Working Mother's Top 100 list? (Owens) If not, can you compare their package with other companies in your field that *are* on the list?

Finally, since most companies allow management discretion, the employee should get a feeling for his or her manger's style. If it is not favorable, is it possible to transfer to another department before having children?

To those not yet considering motherhood, or thinking they may never want to be a mother, I would advise these women to still know the above. While it may not directly affect them, it may set the tone for how the manager treats employees, especially female employees. Further, not all of the mothers interviewed were describing *planned* pregnancies! For both men and women, it would be best to have resources in hand before dealing with such a 'surprise'.

## RECOMMENDATIONS: EMPLOYER

When possible, employers should look to create policies that benefit both men and women, and do not overly draw attention to women as an atypical employee. This is especially true when it comes to maternity policies. When these are actual personal leave or family leave options, make sure they do not appear to be just for female employees.

Also, make sure your formalized policies are known. While some customization should be expected per department, negotiation with the manager should not be the primary means of receiving benefits, such as maternity leave. When possible, post the policy on an internal website where all employees can access it. Also, have a way the employees can get clarification on the policy, not just through line management. For example, the employee might feel more comfortable talking to an HR representative than their direct manager, for fear of management bias, even if unconscious.

In addition to complying with the laws, employers should consider exceeding such laws, such as FMLA. For example, a high-achieving technical mother may be more likely to apply at a mother-friendly company. Many of the companies that exceed legal minimums end up on the Working Mother's Top 100 list. (Owens)

An employer not already on this list, or an employer without formal parental policies, may want to review it for policy ideas. For example, many of the top 100 companies give exceed FMLA's requirements by giving additional unpaid weeks off while still guaranteeing the mother's job. Also, almost all provide some paid leave for mothers.

## RECOMMENDATIONS: MANAGEMENT

However, should the employee come to the manager, the manager should do his or her job to represent the HR policies and not jump to conclusion on upcoming leave.

(For example, if the female employee is merely asking for clarification, not asking for future leave, do not keep her off a key assignment for next year.)

Based on the survey data, as well as the literature, women's views are quite varied on motherhood. A manager should not assume that a woman even wants to have children. Try to treat them in the same manner as you would their male peers, since it is evident that not all technical women choose motherhood, as well as many technical men do have children. While there are trends in the data, most questions had at least one respondent per possible answer. So, no one perspective on career and motherhood can be expected of all female employees.

Overall, workforce trends and cultural phenomenon have greatly changed since studies became prevalent on issues faced by technical women. However, many of the unfortunate deterrents still exist in academic and professional arenas. Governments and private establishments must continue to remove barriers, to increase long-term diversity and ultimately, I believe, improve the technological and financial achievements of these establishments.

# Tables

**TABLE 1:**

Highly conflicted women in U.S. & Israel (Bailyn & Etzion, Table IX)

| Americans | N | % Hi CFC | % Hi BRNT | % Lo ENJ | % Hi DEPL |
|---|---|---|---|---|---|
| Not married/No Children | 81 | 20 | 16 | 12 | 23 |
| Married/No Children | 104 | 32 | 12 | 4 | 39 |
| Mothers/child 6 or less | 37 | 19 | 16 | 8 | 38 |
| Mothers/child over 6 | 47 | 30 | 11 | 6 | 19 |
| **Total** | **269** | **26%** | **13%** | **7%** | **27%** |
| **Israelis** | **N** | **% Hi CFC** | **% Hi BRNT** | **% Lo ENJ** | **% Hi DEPL** |
| Not married/No Children* | 28 | 21 | 19 | 15 | 23 |
| Married/No Children | 13 | 8 | 8 | 0 | 0 |
| Mothers/child 6 or less | 63 | 13 | **15*** | 12 | **21*** |
| Mothers/child over 6 | 72 | **17*** | 6 | 6 | 13 |
| **Total** | **176** | **15%** | **11%** | **9%** | **16%** |

**On a scale of 1-7:**

**Hi CFC is >5** **Lo ENJ IS <4**

**Hi BRNT/DEPL is >4**

**TABLE 2:**

Conflict & Separation

| Rate from '1 - Strongly Disagree' to '5 - Strong Agree' | Females - Mean | # Females Responding | Non-mothers - Mean | # Non-mothers Responding | Mothers - Mean | Mothers – Respond-ing |
|---|---|---|---|---|---|---|
| **Overall Conflict** | | | **3.03** | | **3.49** | |
| **Overall Separation** | | | **2.98** | | **3.31** | |
| My ideals as a woman differ from my ideals as a technical employee. | 3.01 | 105 | 2.73 | 44 | 3.21 | 56 |
| I feel conflicted between my identity as woman and my identity as a technical employee. | 2.57 | 105 | 2.52 | 44 | 2.61 | 56 |
| I keep everything about being a woman separate from being a technical employee. | 2.84 | 105 | 2.52 | 44 | 2.98 | 56 |
| I am someone whose behavior switches between the norms of my gender and the norms of the technical/professional world. | 3.17 | 104 | 2.98 | 44 | 3.4 | 55 |
| Succeeding as a technical employee involves the same sides of myself as succeeding as a woman. | 4.33 | 105 | 4.32 | 44 | 4.36 | 56 |
| I feel torn between the expectations of my gender and of the technical/professional world. | 3.09 | 104 | 2.72 | 43 | 3.38 | 56 |
| My self-concept seamlessly blends my professional identity and my gender identity. | 4.46 | 105 | 4.66 | 44 | 4.32 | 56 |
| I do not feel any tension between my goals as woman and my goals as a technical employee. | 4.05 | 105 | 4.45 | 44 | 3.73 | 56 |

**TABLE 3:**

India & US comparison

| | Females | Female Indian Resident | Female American Resident |
|---|---|---|---|
| **Participants** | 119 | 18 | 111 |
| **Age, mean** | 36.73 | 30.83 | 37.78 |
| **Born in India** | 34 | 18 | 16 |
| **% Mothers** | 56.0% | 57.1% | 55.8% |
| **Career Involvement, mean** | 5.68 | 5.33 | **5.74** |
| **Family Involvement, mean** | 6.06 | **6.27** | 6.03 |
| **Career-family conflict, mean** | 4.21 | 4.00 | 4.25 |
| **Amount of Energy, mean** | 4.73 | **5.50** | 4.60 |
| **Sleep Quality, mean** | 4.27 | **5.13** | 4.13 |
| **Physical Health, mean** | 5.04 | 5.06 | 5.03 |

***depletion grouping

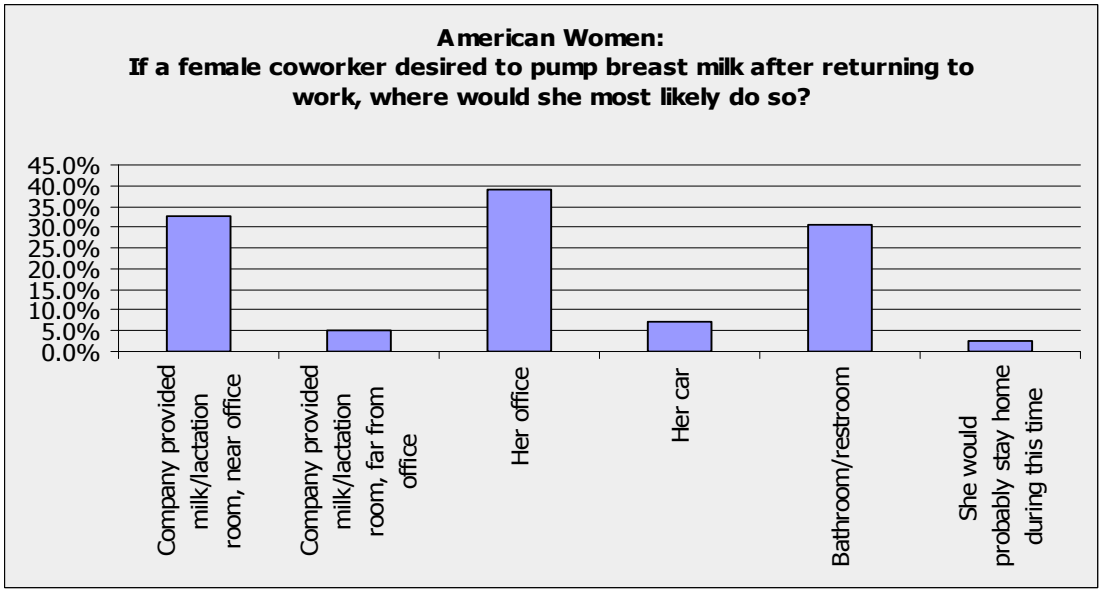
# Figures

**FIGURE 1:**

Expected pumping locations by country:

a)


b)



# Appendices

**APPENDIX A:**

**Survey Page 1**

*1. This survey is intended for women only. (However, you may participate as a man if desired.) Please confirm your sex/gender.

- Female
- Male

*2. Current Age

Age: <numerical textbox>

*3. Current Residence:

- India
- U.S.A.
- Other (please specify) <*textbox*>

4. Country of origin/Where were you born?

- India
- U.S.A.
- Other (please specify; if not willing to specify, simply put 'other') <*textbox*>

5. Relationship status:

- long-term committed heterosexual relationship
- married (homosexual)
- long-term committed homosexual relationship
- divorced
- married (heterosexual)
- single

*6. Which most closely describes your spouse's/long-term partner's professional field?

<drop down list>

- N/A
- Non-technical/Non-engineering
- Aerospace Engineering
- Automotive engineering
- Biological/Chemical Engineering
- Biology
- Chemistry
- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Environmental Engineering
- Industrial Engineering
- Information Technology
- Mathematics
- Mechanical Engineering
- Naval Engineering
- Nuclear Engineering
- Physics
- OTHER Technical
- Unemployed

**Survey Page 2**

*7. Which most closely describes your employment status?

<drop down list>

- Unemployed
- Student
- Academia
- Industry/Public Sector
- Retired

8. Which most closely matches your role? (If retired, put previous role.)

technical staff
professor/trainer
management/project management
other business

9. Which most closely matches your undergraduate/bachelors degree (if any)?

- N/A - no bachelors obtained
- Non-technical/Non-engineeringbachelor obtained
- Aerospace Engineering
- Automotive Engineering

- Biological/Chemical Engineering - Biology
- Chemistry - Civil Engineering
- Computer Engineering - Computer Science
- Electrical Engineering - Environmental Engineering
- Industrial Engineering - Information Technology
- Mathematics - Mechanical Engineering
- Naval Engineering - Nuclear Engineering
- Physics - OTHER technical degree

10. Which most closely describes your professional field?

- Non-technical/Non-engineering - Aerospace Engineering
- Automotive Engineering - Biological/Chemical Engineering
- Biology - Chemistry
- Civil Engineering - Computer Engineering
- Computer Science - Electrical Engineering
- Environmental Engineering - Industrial Engineering
- Information Technology - Mathematics
- Mechanical Engineering - Naval Engineering
- Nuclear Engineering - Physics
- OTHER technical degree

11. Check all that apply: who in your family is in a technical/engineering field?

- Mother - Father - Brother
- Sister - Grandmother - Grandfather
- other family - none

**Survey Page 3**

*12. On a scale of 1-7, how involved are you with the following?

<Range from Not at all to Extremely Involved>

a. Career

b. Family

13. On a scale of 1-7

a. How conflicted do you feel between your career & family involvement?

b. How much do you enjoy your job/career?

14. On a scale of 1-7, please rank the following as currently applies to you.

a. Amount of Energy

b. Sleep Quality

c. Physical Health

15. On a scale of 1-7, please rank the following as currently applies to you.

Please classify your level of burnout based on your own definition of burnout.

a. I enjoy my work. I have no symptoms of burnout.

b. Occasionally I am under stress, and I don't always have as much energy as I once did, but I don't feel burned out.

c. I am definitely burning out and have one or more symptoms of burnout, such as physical or emotional exhaustion.

d. The symptoms of burnout that I'm experiencing won't go away. I think about frustration at work a lot.

e. I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help.

**Survey Page 4**

16. Please read the statements below and rate the extent to which they describe your personal experience.

<Range from Strongly Disagree to Strongly Agree>

- My ideals as a woman differ from my ideals as a technical employee.

a. I feel conflicted between my identity as woman and my identity as a technical employee.

b. I keep everything about being a woman separate from being a technical employee.

c. I am someone whose behavior switches between the norms of my gender and the norms of the technical/professional world.

d. Succeeding as a technical employee involves the same sides of myself as succeeding as a woman.

e. I feel torn between the expectations of my gender and of the technical/professional world.

f. My self-concept seamlessly blends my professional identity and my gender identity.

g. I do not feel any tension between my goals as woman and my goals as a technical employee.

**Survey Page 5**

17. Now think of the same questions you just responded to but consider yourself 5 years ago. What was your life like back then? How might you have answered the questions differently 5 years ago? Please do your best to respond to the following questions based on yourself 5 years ago:

<Much Less Than Now, Somewhat Less, No Difference, Somewhat More, Much More, N/A - had not entered the workforce 5 years ago>

a. How did your experience of separation between your professional identity and your identity as a woman five years ago compare to your experience now?

b. How did your experience of conflict between your professional identity and your identity as a woman five years ago compare to your experience now?

18. Now consider yourself 5 years from now. What do you expect your life to be like in the future? How might you answer the original questions differently 5 years in the future? Please do your best to respond to the following questions based on your expectations of yourself 5 years from now:

<Much Less Than Now, Somewhat Less, No Difference, Somewhat More, Much More>

a. How do you expect your experience of separation between your professional identity and your identity as a woman five years from now will compare to your experience now?

b. How do you expect your experience of conflict between your professional identity and your identity as a woman five years from now will compare to your experience now?

**Survey Page 6**

19. Through your childhood, what was your overall experience with your father's career:

- He worked outside the home full-time.
- He worked outside the home part-time.
- He worked as your family's caregiver/stay-at-home dad.
- N/A

20. Through your childhood, what was your overall experience with your mother's career:

- She worked outside the home full-time.
- She worked outside the home part-time.
- She worked as your family's caregiver/stay-at-home mom.
- N/A

**Survey Page 7**

21. What is your company's size?

<25 employees

25-100 employees

100-500 employees

500-3000 employees

3000-15000 employees

>15000 employees

22. What is the percentage of women in your immediate work group (i.e. department)?

<20%

20-40%

40-60%

60-80%

>80%

23. What is the percentage of women with whom you professionally interact? (For example, in addition to your department, peers in other departments, customers, etc.)

<20%

20-40%

40-60%

60-80%

>80%

24. Do you have children (adopted, biological or stepchildren)?

Yes

No

**Survey Page 8**

25. Number of Children (for all that apply):

a. adopted child(ren) (was an infant)

b. adopted child(ren) (toddler or older)

c. biological child(ren)

d. stepchild(ren)

26. Child's/Childrens' Current Ages (leave blank all that do not apply):

a. adopted (youngest)

b. adopted (oldest if more than 1 adopted child)

c. biological(youngest)

d. biological (oldest if more than 1 biological child)

e. stepchild(ren) (youngest)

f. stepchild(ren) (oldest if more than 1 stepchild)

27. How many (calendar) days were you on maternity leave? (For leaves longer than 1 month, you may simplify calculations by using a 30 day month, and a 365 day year.)

a. days until you returned to do some part time work?

b. days until you returned to full time work?

28. If you continued to nurse/pump breast milk after returning to work:

<Very Uncomfortable, Uncomfortable, Neutral, Comfortable, Very Comfortable, N/A>

a. How comfortable were you in discussing/researching your options to do so at your company? (for example, online or talking to your manager)

b. How comfortable were you in nursing/pumping at work?

**Survey Page 9**

29. When you see women who have children and work in your field:

<Never, Rarely, Sometimes, Often, Very Often>

a. Have you ever (negatively) judged their motherhood/career balance?

b. Have you ever (negatively) judged their maternity leave decision(s)?

30. If a female coworker desired to pump breast milk after returning to work, where would she most likely do so?

- Company provided milk/lactation room, near office
- Company provided milk/lactation room, far from office
- Her office
- Her car
- Bathroom/restroom
- She would probably stay home during this time
- Other (please specify)

**Survey Page 10**

31. Please share any thoughts you have on motherhood and your career, whether or not you are a mother.

<textbox>

## References


AAUW (2000) Tech-Savvy: Educating Girls in the New Computer Age. *American Association of University Women Educational Foundation. (2000).*

Alewell, D. & Pull, K. (2005) AN INTERNATIONAL COMPARISON AND ASSESSMENT OF MATERNITY LEAVE LEGISLATION. From the University of Illinois, College of Law website: http://www.law.uiuc.edu/publications/cll&pj/archive/vol_22/issue_2/PullArticle22-2-3.pdf

Amble, Brian. (2007, October 1). More women on the board leads to better results. Retrieved from Management-Issues. http://www.management-issues.com/2007/10/1/research/more-women-on-the-board-leads-to-better-results.asp

Bastalich, Wendy; Franzway, Suzanne; Gill, Judith; Mills, Julie; Sharp, Rhonda. (2007) Disrupting Masculinities. *Australian Feminist Studies; Nov2007, Vol. 22 Issue 54*, p385-400, 16p

Beyer, Sylvia, Kristina Rynes, and Susan Haller. (2004) Deterrents to Women Taking Computer Science Courses." *IEEE Technology and Society Magazine 23.1 (Spring 2004)*, 21-28.

Blackwell, Louisa; Glover, Judith. (2008) Women's Scientific Employment and Family Formation: A Longitudinal Perspective. Gender, Work & Organization; Nov2008, Vol. 15 Issue 6, p579-599, 21p

Blickenstaff, Jacob Clark. (2005) Women and science careers: leaky pipeline or gender filter? *Gender & Education; Oct2005, Vol. 17 Issue 4*, p369-386, 18p

Cole, A., T. Conlon, S. Jackson and D. Welch. (1994) Information Technology and Gender: Problems and Proposals. *Gender and Education. 6.1 (1994),* 77-85.

Comber, C., A. Colley, D.J. Hargreaves and L. Dorn. (1997) The Effects of Gender and Computer Experience Upon Computer Attitudes. *Educational Research. 39.2 (1997)*, 123-34.

Culley, L. (1986) Gender Differences and Computing in Secondary Schools. *Loughborough: Department of Education. (1986).*

Demaiter, Erin I., Adams, Tracey L. (2009) I Really Didn't Have Any Problems With the Male-Female Thing Until… Successful Women's Experiences in IT

Organizations. *Canadian Journal of Sociology; Winter2009, Vol. 34 Issue 1*, p31-53, 23p

Donovan, Claire; Hodgson, Barbara; Scanlon, Eileen; Whitelegg, Elizabeth (2005) Women in higher education: Issues and challenges for part-time scientists *Women's Studies International Forum; May2005, Vol. 28 Issue 2/3*, 247-258

Durndell, A., H. Macleod, and G. Siann. (1987) A Survey of Attitudes to, Knowledge About and Experience of Computers. *Computer Education. 11.3 (1987)*, 167-75.

Equal Pay Act of 1963, (1963) from U.S. Equal Employment Opportunity Commission website: http://www.eeoc.gov/laws/statutes/epa.cfm

Etzion, Dalia; Bailyn, Lotte (1994) Patterns of Adjustment to the Career/Family Conflict of the Technically Trained Women in the United States and Israel *Journal of Applied Social Psychology; 9/1/94, Vol. 24 Issue 17*, 1520-1549

Etzion, D., Nicolauo-Smokoviti, L., & Bailyn L. (1993) A cross-cultural comparison of American, Israeli and Greek women pursuing technical and scientific careers. *The International Review of Sociology, 1-2*, 76-94

Evetts, Julia Career and Motherhood in Engineering: cultural dilemmas and individualistic solutions. (1994) *Journal of Gender Studies; Jul94, Vol. 3 Issue 2*, 177

Hartmann, Heidi Ph.D., Lovell, Vicky, Ph.D., & Werschkul, Misha. (2004) Women and the Economy: Recent Trends in Job Loss, Labor Force Participation, and Wages from Institute for Women's Policy Research Website: http://www.iwpr.org/pdf/B245.pdf

Hoyles, C. (1988) Girls and Computers.

Huff, C.W. and J. Cooper. (1987) Sex Bias in Educational Software: The Effect of Designers. *Journal of Applied Social Psychology. 17.6 (1987)*, 519-32.

IBM EX.I.T.E. camps. Retrieved from http://www.ibm.com/ibm/ibmgives/grant/education/camp.shtml

Jones, C. & Causer, G. (1995). 'Men Don't Have Families': Equality and Motherhood in Technical Employment. *Gender, Work and Organization; Volume2, Number 2, April 1995,* 51-62.

Maskell-Pretz, Marilyn; Hopkins, Willie E. (1997) Women in engineering: Toward a barrier-free work environment *Journal of Management in Engineering; Jan/Feb97, Vol. 13 Issue 1*, 32

McDowell, Charlie, Linda Werner, Heather E. Bullock, and Julian Fernald. (2006) Pair Programming Improves Student Retention, Confidence, and Program Quality. *Communications of the ACM 49.8 (Aug. 2006)*, 90-5.

New Alliance Launches Drive for More Women in IT. (2007) *T H E Journal. 34.8 (Aug. 2007)*, 14.

Newton, P. (1991) Computing: An Ideal Occupation for Women? *Women at Work: Pyschological and Organizational Perspectives. (1991)*, 143-53.

No Author, (2002) Bouncing Back: Jobs, Skills and the Continuing Demand for IT Workers. *Information Technology Association of America (ITAA). (2002).*

Owens, J. & Riss, S. (2008) Focus on the 100 Best. from the Working Mother website: http://www.workingmother.com/web;jsessionid=799AA32A654BA8A2884C1DAB2FB7FEA8?service=direct/1/ViewArticlePage/dlinkFullFeaturedArticle&sp=1652&sp=94

Papastergiou, Marina. (2008) Are Computer Science and Information Technology still masculine fields? High school students' perceptions and career choices *Computers & Education 51.2 (Sep. 2008)*, 594-608.

Patterson, David A. (2005) Restoring the Popularity of Computer Science. *Communications of the ACM 48.9 (Sep. 2005)*, 25-28.

Pearl, A., M. Pollack, E. Riskin, E. Wolfe, B. Thomas and A. Wu. (1990) Becoming a computer scientist. *Communications of the ACM **33** (11) (1990)*, 47–57.

Pimor, Alexandra (2004) Right to Breastfeed in the Workplace? Williams v Ministry of Defence [2003] All ER (D) 142. *Journal of Social Welfare & Family Law; Oct2004, Vol. 26 Issue 3*, 289-300

Ranson, Gillian (2005) No Longer "One of the Boys": Negotiations with Motherhood, as Prospect or Reality, among Women in Engineering. *Canadian Review of Sociology & Anthropology; May2005, Vol. 42 Issue 2*, 145-166

Rohland, B. M., Kruse, G. R., & Rohrer, J. E. (2004, April 7) Validation of a single-item measure of burnout against the Maslach Burnout Inventory among physicians. *Stress and Health, Volume 2 Issue 2*, 75-79.

Roberts, E (2003) Expanding the audience for computer science. *Proc. Thirty-Fourth SIGCSE Tech. Symp. on Computer Science Education. (2003).*

Shashaani, L. (1994) Gender Differences in Computer Experience and Its Influence on Computer Attitudes. *Journal of Educational Computing Research. 11.4 (1994)*, 347-67.

Simosko, Nina. (2008, March 17) Want Higher Profits? Smash the Glass Ceiling. Retrieved from http://ninasimosko.com/blog/2008/03/07/want-higher-profits-smash-the-glass-ceiling/

Spears, J. D. (2006) Seeing Gender: Tools For Change from http://www.meac.org/Resources/ed_services/SG_WEB/SeeingGender/index.html

Spears, Jacqueline D. (2008) Seeing Gender. *THE PHYSICS TEACHER 65 (Mar. 2008)*, 136-7.

Spears, Jacqueline D. (2006) Seeing Gender: Tools For Change from http://www.meac.org/Resources/ed_services/SG_WEB/SeeingGender/index.html

Stolberg, S. G. (2009, January 29) Obama Signs Equal-Pay Legislation. From the New York Times Website: http://www.nytimes.com/2009/01/30/us/politics/30ledbetter-web.html

Teaching With Documents: The Civil Rights Act of 1964 and the Equal Employment Opportunity Commission. from the National Archives website: http://www.archives.gov/education/lessons/civil-rights-act/

*The Guardian.* (21 December 1996): 6.

The U.S. Equal Employment Opportunity Commission, (2004, March 20) Glass Ceilings: The Status of Women as Officials and Managers in the Private Sector. From the U.S. Equal Employment Opportunity Commission website: http://www.eeoc.gov/eeoc/statistics/reports/glassceiling/

The U.S. Equal Employment Opportunity Commission, (2000, July 6) The Family and Medical Leave Act, the Americans with Disabilities Act, and Title VII of the Civil Rights Act of 1964. . From the U.S. Equal Employment Opportunity Commission website: http://www.eeoc.gov/policy/docs/fmlaada.html

U.S. GAO (2003) WOMEN'S EARNINGS: Work Patterns Partially Explain Difference between Men's and Women's Earnings. From GAO Website: http://www.gao.gov/new.items/d0435.pdf

Varma, Roli. (2007) Decoding the Female Exodus from Computing. *Information, Communication & Society 10.2 (Apr. 2007),* 181-193.

Varma, Roli, and Marcella Lafever. (2007) Importance of Gender Homophily in the Computer Science Classroom. *IEEE Technology and Society Magazine 26.2 (Summer 2007)*, 43-47.

Wallon, G. (2002) Tapping into the pool of women: Facing a serious shortage of skilled workers, Europe's high-tech economies are discovering the value of working

women. From the PubMed Central website: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1084072/

Weinberger, Catherine J. (2004) Just Ask! Why Surveyed Women Did Not Pursue IT Courses or Careers. *IEEE Technology and Society Magazine 23.2 (Spring 2004)*, 28-35.

Williams, J. & Segal, N. (2002) THE NEW GLASS CEILING: MOTHERS AND FATHERS SUE FOR DISCRIMINATION. From the Work Life Law website: http://www.worklifelaw.org/pubs/newglassceiling.pdf

Wilson, Fiona. (2003) Can compute, won't compute" women's participation in the culture of Computing. *New Technology, Work & Employment 18.2 (July 2003),* 127-142.

Women's Suffrage, In Wikipedia from http://en.wikipedia.org/wiki/Women%27s_suffrage

www.ncwit.org

# Vita

Adrianne currently resides in Austin, Texas. Her bachelor's degree is in computer science, with minors in environmental studies and music. Professionally, she has experience in both project management and technical outsourcing. In her technical role, she supported middleware for both internal and external clients. In 2006, she moved into a project management role with varied projects, such as release management for firmware and operating system releases.

Permanent email: stropesa@alumni.southwestern.edu

This report was typed by Adrianne Marie Stropes.